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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
MALDONADO, JULIO J

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 11/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/843,023	LOSEE, BECKY	
	Examiner	Art Unit	
	Julio J. Maldonado	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) *25-51* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 April 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of claims 1-24 in Paper No. 10 is acknowledged. The traversal is on the ground(s) that the office has not established a proper criterion for a restriction requirement. This is not found persuasive because different classifications and required fields of search not being coextensive for the two inventions indicate a serious burden.

The requirement is still deemed proper and is therefore made FINAL.

the different classifications and required fields of search not being coextensive for the two inventions to indicate a serious burden.

Drawings

2. Figures 2-4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: in page 9, line 35, reference character “22” does not appear on the drawings. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 4-7, 10 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Shoji et al. (U.S. 5,928,965).

In reference to claims 4 and 22, Shoji et al. (Figs.1a-1c) in a related method to form a trench in a semiconductor substrate teach the steps of providing a silicon layer (101); providing a patterned mask (102, 103, 104, 105) over the silicon layer (101); etching the silicon layer (101) with a uniform plasma gas comprising a chlorine-containing gas, a passivating gas, a selectivity gas, and a diluent gas; and removing the patterned gas (102, 103, 104, 105) (column 3, line 40 – column 4, line 12).

In reference to claims 5-7 and 10, Shoji et al. teach the chlorine containing gas comprising Cl_2; the passivating gas comprising HBr; the selectivity gas comprising O_2; and wherein the etching is performed in a single step (column 3, line 40 – column 4, line 12).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-3, 8 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoji et al. ('965) in view of Yi (U.S. 5,900,163).

Shoji et al. (Figs.1a-1c) in a related method to form a trench in a semiconductor substrate teach the steps of providing a silicon layer (101); providing a patterned mask (102, 103, 104, 105) over the silicon layer (101); etching the silicon layer (101) with a uniform plasma gas comprising a Cl_2, HBr, O_2, and a He; and removing the patterned gas (102, 103, 104, 105) (column 3, line 40 – column 4, line 12).

Shoji et al. fails to teach etching the substrate using argon instead of helium. However, Yi et al. in a related method to form trenches in a semiconductor substrate teach that inert gases such as helium and argon can be used to etch tapered semiconductor substrates (column 1, lines 40-59). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use either helium or argon as taught by Yi et al. in the trench fabrication method of Shoji et al., since both gases can be used as carrier gases and can also aid in etching by physical sputtering (column 1, lines 49-53).

In reference to claims 2 and 3, Shoji et al. in combination with Yi et al. substantially teach all aspects of the invention but fail to show the deep trench having a

depth ranging from about 1,25 microns to about 20 microns. However, the selection of the claimed range is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious).

9. Claims 9, 11-19, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoji et al. ('965) in view of Miller et al. (column 6,218,309).

Shoji et al. (Figs.1a-1c) in a related method to form a trench in a semiconductor substrate teach the steps of providing a silicon layer (101); providing a patterned mask (102, 103, 104, 105) over the silicon layer (101); etching the silicon layer (101) with a uniform plasma gas comprising a chlorine-containing gas, a passivating gas, a selectivity gas, and a diluent gas; and removing the patterned gas (102, 103, 104, 105) (column 3, line 40 – column 4, line 12).

Shoji et al. fails to teach forming a plurality of trenches in the silicon layer having a depth uniformity of less than about 2%. However, Miller et al. (Figs.1a-1c) in a related method to form a plurality of trenches teach forming trenches having a depth uniformity of 2% or less (column 11, lines 3-5). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to form a plurality of trenches having a depth uniformity of 2% or less as taught by Miller et al. in the trench formation method of Shoji et al., since this improves surface level of the device and its yield (column 2, lines 43-55).

Shoji et al. in combination in Miller et al. fails to teach having a sidewall angle uniformity of less than about 0.5% or 0.15%; the variance in trench depth is less than about 50-500 Å; and the sidewall angle is about 89°. However, the selection of the claimed range is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious).

10. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shoji et al. ('965), Yi et al. ('163) and Miller et al. ('309).

Shoji et al. (Figs.1a-1c) in a related method to form a trench in a semiconductor substrate teach the steps of providing a silicon layer (101); providing a patterned mask (102, 103, 104, 105) over the silicon layer (101); etching the silicon layer (101) with a uniform plasma gas comprising a Cl_2, HBr, O_2, and a He; and removing the patterned gas (102, 103, 104, 105) (column 3, line 40 – column 4, line 12).

Shoji et al. fails to teach etching the substrate using argon instead of helium. However, Yi et al. in a related method to form trenches in a semiconductor substrate teach that inert gases such as helium and argon can be used to etch tapered semiconductor substrates (column 1, lines 40-59). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use either helium or argon as taught by Yi et al. in the trench fabrication method of Shoji et

al., since both gases can be used as carrier gases and can also aid in etching by physical sputtering (column 1, lines 49-53).

Shoji et al. in combination with Yi et al. fail to teach forming a plurality of trenches in the silicon layer having a depth uniformity of less than about 2%. However, Miller et al. (Figs.1a-1c) in a related method to form a plurality of trenches teach forming trenches having a depth ranging from about 1.5 to about 25 microns (column 15, lines 50-67) and a depth uniformity of 2% or less (column 11, lines 3-5). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to form a plurality of trenches having a depth of about 1.5 to 25 microns and a depth uniformity of 2% or less as taught by Miller et al. in the trench formation method of Shoji et al. and Yi et al., since this improves surface level of the device and its yield (column 2, lines 43-55).

Conclusion

11. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-

mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

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